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PATENT SPECIFICATION

NO DRAWINGS

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COMPLETE SPECIFICATION

Improved Animal Feed Compositions

We, COMMERCIAL SOLVENTS CORPORATION, a corporation organized and existing under the laws of the State of Maryland, United States of America, of 260 Madison Avenue, New York, State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to animal feed compositions. More particularly, it relates to animal feed compositions containing residues from the production of glutamic acid by fermentation.

Palatability is an important factor in the feed intake of animals. Many feed additives have constantly been tried in an effort to obtain a satisfactory palatability enticer in feed compositions, but these additives have usually been expensive and did not themselves contribute a well rounded variety of nutrients to the feed composition. We have now invented a new feed additive which not only is a palatability enticer but also contains a well rounded variety of nutrients.

Glutamic acid, produced by fermentation, is generally recovered from its fermentation medium by filtering the fermentation medium, condensing the filtrate, and adjusting the filtrate to a pH of about 3.2 thereby crystallizing glutamic acid. The filtered residue consisting of the remaining solids from the fermentation and the supernatant liquid from the crystallized glutamic acid are together termed "fermentation residue" as used in this disclosure and the appended claims. This fermentation residue can be dried by any convenient means and used in the dry form as well as the liquid form.

It is an object of the instant invention to provide an animal feed composition containing the fermentation residue from the production of glutamic acid.

It is a further object of the instant invention to provide an animal feed composition which is palatable.

This invention is concerned with animal feed compositions prepared by incorporating fermentation residues from glutamic acid production into animal feed rations and onto roughages.

According to the invention there is provided a nutrient feed composition comprising a nutrient feed ration containing between about 0.1% and 25% by weight of fermentation residue from the production of glutamic acid by fermentation. A typical dried fermentation residue obtained from glutamic acid production contains about 15% glutamic acid, 5% ash, 20% proteins, 40% carbohydrates, 10% non-nitrogenous organic material, and 10% moisture. This material is readily accepted by animals; and in addition to its nutritional contribution, increases the palatability of the final ration and improves the physical condition of the final mixed feed.

The fermentation residue is useful for the feeding of cattle, swine, sheep, dogs, cats, poultry, and other animals. In the feeding of cattle and of sheep it has been discovered that the glutamic fermentation residue is substantially equal in feeding value to distillers solubles. The dried fermentation residue is added to the ration in amounts of between about 0.1% and 25% by weight of the feed.

The amount of dried fermentation residue incorporated into any ration is a matter of choice and is determined by the purpose for which it is to be employed. For example, as a source of protein for poultry, between about 10 pounds and 100 pounds of dried fermentation residue per U.S. short ton of finished ration may be employed. However, for chicks and broiler rations, it is preferable to incorporate about 40 pounds of dried fermentation residue per U.S. short ton of finished feed. For cattle and sheep, from about 10 pounds to 25 pounds of dried fermentation residue per

100 pounds of ration, preferably between about 10 and 15 pounds of fermentation residue per 100 pounds of ration are employed. If desired, equivalent amounts of liquid fermentation residue can be substituted for the dried fermentation residue amounts herein described. It has also been discovered that when as little as between about 0.25% and about 5% by weight of dried fermentation residue is added, the palatability of the feed is improved. The dried fermentation residue can be added to any kind of animal food. It can be incorporated into liquid rations or into solids or mixtures of liquids and solids. For example, glutamic acid fermentation residue has been added to rations of alfalfa, maize, hay, grain, silage, beet pulp, protein meal, and the like, with very satisfactory results.

When the dried fermentation residue is used in rations to improve the physical characteristics of the feed for animals, that is, to increase palatability and/or the consistency of the mixture, any quantity may be used depending upon other ingredients involved and their physical properties, keeping in mind the physical properties of the final mixture desired. Any reasonable quantity used in the ration will not cause unfavourable results. This fermentation residue, when added to dog or cat foods, especially improves the appeal of the final product with respect to aroma, consistency, and eye appeal.

The fermentation residue can be incorporated into feed mixtures and roughages by any conventional method used for incorporating additives into such mixtures. The fermentation residue can be mixed directly into a batch of animal ration, or it can become part of a premix.

In a specific embodiment of the instant invention, a mixture of dried fermentation residue and dried beet pulp is used as approximately 1/3 of the ration for fattening steers. The amount of fermentation residue dried on the pulp is sufficient to furnish about 20% of the total solids of the mixture. Gain in weight by the steers which received the fermentation residue with the beet pulp in a ration is substantially the same as the gain in weight of the steers fed similar amounts of molasses in beet pulp rations. The high concentration of nitrogenous materials in the fermentation residue is desirable for use with beet pulps since the beet pulp itself is very low in protein.

Any glutamic acid fermentation can be used to produce the fermentation residue of the invention. An excellent fermentation residue is provided from the fermentation utilizing the organism *Brevibacterium divaricatum*. A specific example of how a fermentation residue is obtained is described below.

Example I

To prepare the fermentation residue of the invention, a glutamic acid producing strain of *Brevibacterium divaricatum* was cultivated for 20 hours at 30° C. in a seed culture medium of the following composition:

Glucose	3%
Urea	0.5%
K_2HPO_4	0.1%
$MgSO_4.7H_2O$	0.05%
Bouillon extract	0.2%
Wheat bran extract (5%)	2%
Water to volume	

The seed culture was then used to inoculate a medium having the following composition:

Glucose	10%
Urea	1%
K_2HPO_4	0.1%
$MgSO_4.7H_2O$	0.05%
Wheat bran extract	4%
Water to volume	
pH adjusted to	7.3

The above medium was cultivated at 30° C. and 0.5% of urea and 1% of ammonium tartrate added thereto at the end of 18, 26, 32, 40, and 48 hours after inoculation. The fermentation was stopped at the end of that time and the whole fermentation medium was filtered, the solids were separated and kept and the filtrate was condensed and adjusted to a pH of about 3.2 thereby crystallizing glutamic acid. The crystals were removed and the supernatant liquid was added to the filtered residue solids and this comprised the fermentation residue. Portions of this fermentation residue were dried in a drum dryer and thus formed the dried fermentation residue.

Example II

The following basal swine ration was prepared.

BASAL SWINE RATION

Ingredient	Amount
Ground yellow maize	188.50 pounds
Cane sugar	75 pounds
Soybean meal containing 50% by wt. protein	120.25 pounds
Fish solubles	12.50 pounds
Dried whey	75 pounds
Lard	12.50 pounds
Limestone	3.50 pounds
Dicalcium phosphate	4.75 pounds
Iodized salt	2.50 pounds
Vitamin A supplement (10,000 IU/g)	125 grams
Vitamin D_2 supplement (4000 IU/lb)	30 grams
Riboflavin supplement (3.63 mg riboflavin/lb.)	160 grams
Calcium pantothenate supplement 32 (32% by weight calcium pantothenate)	30 grams
Niacin 50% (standard vitamin composition containing 50% niacin by wt.)	20 grams
Choline chloride 25% (standard supplement containing 25% by wt. choline chloride)	115 grams
Vitamin B_{12} supplement (6 mgm B_{12}/lb)	750 grams
Bacitracin supplement (zinc bacitracin 10g/lb.)	1,135 grams
Antioxidant	28.5 grams
Trace mineral mix	115 grams
Zinc oxide	28.5 grams

The test variant contained the basal swine ration plus five pounds of dried fermentation residue.

The test was conducted by placing two feeders in each swine pen at equal distance from the waterer. Feeder positions in each pen were designated as positions 1 and 2. A given feeder always contained the same ration but its position in the pen was changed every three days. Each feeder was placed on a board large enough to collect waste feed and the waste feed was weighed back and discarded each time the feeder position was changed. The feeders were removed from each pen, thoroughly cleaned and replaced with clean feeders every six days. At the end of 24 days of testing, it was found that the swine had a decided preference for the feed ration containing the fermentation residue over the basal feed ration that was consumed by the swine. weight of the feed containing the fermentation residue was consumed by the swine as compared to only 38.8% by weight of the basal feed reation that was consumed by the swine.

EXAMPLE III

Cattle feed was tested in a similar manner as described in Example II and results comparable to those in Example II were obtained.

EXAMPLE IV

Poultry feed was tested in a manner similar to that described in Example II and results comparable to those of Example II were obtained.

WHAT WE CLAIM IS:—

1. A nutrient feed composition comprising a nutrient feed ration containing between about 0.1% and 25% by weight of fermentation residue from the production of glutamic acid by fermentation.

2. A composition as claimed in Claim 1 wherein the fermentation residue is in a dry form.

3. A nutrient feed composition substantially as herein described with reference to Examples II, III and IV.

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